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INVESTIGATION OF THE VASCULAR REACTION OF THE
NASAL MUCOSA IN COSMONAUTS

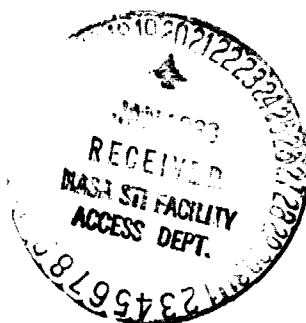
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16. Abstract Rhinopneumometric examinations in 3 positions of the body have been undertaken in 36 cosmonauts aged 25 to 45 years, 14 of whom participated in space flights of various lengths. The nasal vascular response standards were defined in persons of the group examined. A subjective characteristic of the nasal vascular reactions arising during the flight is also provided. Examinations of 14 people were performed before and after the space flight. The rise of intranasal resistance in the horizontal body position permits forecasting different degrees of nasal breathing disturbances during a period of acute adaptation to weightlessness owing to vasomotor alterations of the nasal mucous membrane.					
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INVESTIGATION OF THE VASCULAR REACTION OF THE
NASAL MUCOSA IN COSMONAUTS

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The redistribution of blood and body fluids in the upper half of the body is one characteristic reaction of the human body in the initial period of weightlessness. In the period of acute adaptation to weightlessness, stuffiness of the nose without any signs of rhinitis was noted in a number of cosmonauts and astronauts. Nasal breathing disorders were accompanied by a feeling of heaviness and "rush of blood" to the head, puffiness of the face and other symptoms characteristic of the redistribution of blood and body fluids in the upper half of the body [3, 4, 1 et al]. /44*

Materials are presented in the present investigation which were obtained in study of the vascular reactions of the noses of 36 cosmonauts from 25 to 45 years old, of whom 14 participated in space flights of varied durations in the Salyut-Soyuz orbital complex. According to LOR [orhinolaryngological] examination data, slight signs of vasomotor changes of the mucosa were found by rhinoscopy in two cosmonauts, and slight deviation of the nasal septum without functional disorders was found in 5 cosmonauts.

Intranasal resistance was studied by means of a domestic rhinopneumometer [2]. The examinations were conducted with the persons examined in the sitting position, lying 15 min in the horizontal position and again sitting after return to the sitting position. The rhinopneumometry indicators of those examined are presented in Table 1.

No significant differences in the rhinopneumometry indicators

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upon change of the body position were found from the average data. These rhinopneumometry indicators of the cosmonauts corresponded to the results of examination of healthy persons of a similar age. It should be emphasized at the same time that the intranasal resistance of some cosmonauts increased by 2-3 mm H₂O upon changing to the horizontal position, and the change to the horizontal position caused practically no change of the intranasal resistance of other cosmonauts. A 15 min stay of 3 of the 5 men with insignificant deviation of the nasal septum in the horizontal position was accompanied by an increase of the intranasal resistance to 17-18 mm H₂O. The change to the vertical position was accompanied by a rapid recovery (in 1-2 min) of the initial intranasal resistance. The intranasal resistance of persons with vasomotor changes of the nasal mucosa reached 18-20 mm H₂O in the horizontal position, and its recovery was longer (3-5 min).

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TABLE 1. AVERAGE RHINOPNEUMOMETRY
CHARACTERISTICS OF COSMONAUTS EXAMINED

а Объект ринопневмометрии	б Сидя	с Лежа	в Сидя
Правая половина носа (n=36) d	9±0,4	11±0,7	8±0,5
Левая половина носа (n=36) e	9±0,5	11±0,6	9±0,6

Note: Here and in Table 2, P=5.

Key: a. Rhinopneumometry target
b. Sitting
c. Prone
d. Right half of nose
e. Left half of nose

It follows from the reports of the cosmonauts that, in the acute period of adaptation to weightlessness, characteristic symptoms of the redistribution of blood in the upper half of the body was noted in 9 of 14 men. These reactions were manifested 1-3 hours after entering weightlessness, and they lasted 1-3 and sometimes 5-6 days.

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Stiffness of the nose in flight was combined with changes in rhinopneumometry as a rule.

**TABLE 2. RHINOPNEUMOMETRY INDICATORS OF COSMONAUTS
BEFORE AND AFTER SPACE FLIGHT (AVERAGE DATA)**

а Период обследо- вания	б Сидя		с Лежа		б Сидя	
	д правая половина носа	е левая половина носа	д правая половина носа	е левая половина носа	д правая половина носа	е левая половина носа
До полета (n=14)	9±0,7	9±0,8	13±1,7	12±1,3	9±0,9	10±1,4
г После полета (n=14)	9±1,0	9±0,7	13±1,6	14±2,8	8±1,1	9±0,7

Key: а. Observation period е. Left half of nose
 б. Sitting ф. Before flight
 с. Prone г. After flight
 д. Right half of nose

Average data of rhinopneumometry of 14 cosmonauts examined 30-45 days before a space flight and 3-5 days after its completion are presented in Table 2.

It follows from Table 2 that the baseline rhinopneumometry indicators correspond to the results recorded in the training period. The average indicators after 15 min in the horizontal position increased somewhat, but they did not exceed the physiological scatter of this reaction observed in healthy persons [5]. The change to the sitting position was accompanied by rapid recovery of the initial intranasal resistance. After the flights of 6 of the 14 cosmonauts examined, a tendency was noted to a decrease of the intranasal resistance upon changing from the horizontal body position to the vertical position. In this case, the intranasal resistance decreased by 2-3 mm H₂O below the initial level, and it reached the initial values after 10-15 min. According to the average data, this tendency is evident in investigation of the right half of the nose (see Table 2). Such reactions could be caused by the outflow of blood to the lower half of the body in the postflight readaptation period and change in regulation of vascular tone after the flight [6].

The analysis carried out permits the importance of vascular reactions of the nasal mucosa in nasal breathing disorders of the cosmonauts in the period of acute adaptation to weightlessness to be noted.

A modification of rhinopneumometry (its combination with variable body position) can be applied for quantitative characterization of the change of nasal breathing due to the vasomotor component and, to a certain extent, to predict vasomotor reactions of the nasal mucosa in the period of the acute effect of weightlessness.

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